

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

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In the Matter of)

Service Rules for the 746-764 and 776-794 MHz)
Bands, and Revisions to Part 27 of the)
Commission's Rules)

WT Docket No. 99-168

To: The Commission

PETITION FOR RECONSIDERATION OR CLARIFICATION

TRW INC.

Norman P. Leventhal
Walter P. Jacob

Leventhal, Senter & Lerman P.L.L.C.
2000 K Street, N.W.
Suite 600
Washington, DC 20006-1809
(202) 429-8970

February 11, 2000

Its Attorneys

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SUMMARY

TRW Inc. (“TRW”), by its attorneys, hereby seeks reconsideration or clarification, as necessary and appropriate, of certain aspects of the Commission’s First Report and Order (“First R&O”) in this proceeding and certain rule changes adopted in that decision. As adopted, the First R&O and associated rules do not achieve the Commission’s stated objectives of making the 746-764 and 776-794 MHz bands available to a variety of wireless services including high-speed Internet access; allowing licensees to choose the technologies they will use in providing those services; or permitting the most efficient and intensive use of the spectrum. Unfortunately, the First R&O and associated rules contain a number of ambiguities and internal contradictions that unfairly jeopardize the ability of fixed wireless service providers – particularly those using Time Domain Duplex (“TDD”) systems – to make use of the 700 MHz sub-bands. TRW is especially concerned that the 30 W power limit that the Commission established for most wireless operations in the 776-794 MHz band would effectively prohibit operation of any base station providing broadband Internet services in that band – in spite of the fact that fixed service systems will employ both base and mobile stations in both of the 700 MHz sub-bands.

To address this problem, the Commission should affirm its original objectives by allowing base, mobile or fixed operations in both the upper and lower 700 MHz sub-bands up to appropriate power limits for each type of operation, rather than designating each band for particular types of wireless operations as it did in the First R&O. This approach, which was employed by the Commission in its rules for Broadband PCS, will permit the same level of protection for other services as the Commission’s current approach while enabling fixed services

to make full use of the 776-794 MHz band.

In addition, or, if necessary, in the alternative, the Commission should modify its power thresholds to permit an averaging of the power limits in the two 700 MHz sub-bands such that 500 W ERP is allowed for all wireless base station operations in both the 746-764 and 776-794 MHz bands. By so doing, the Commission will allow viable base station operations in the 776-794 MHz band without causing any increase in overall out-of-band interference to parties operating in the nearby public safety bands.

In connection with the aforementioned changes, the Commission should also clarify that, for purposes of the power limits and out-of-band emission limits established for the 746-764 and 776-794 MHz bands, the definition of “maximum composite transmit power” will be construed as being measured over a reasonable period of time, i.e., three microseconds. Given that the typical maximum data rates and channel bandwidths for operations in the public safety bands are well below 200 KHz, employing this degree of power averaging for purposes of measuring wireless transmissions will have no impact on public safety operations.

The clarifications proposed by TRW herein will serve the public interest, convenience and necessity by affording the public a greater variety of wireless services – including residential broadband access -- and the resulting increase in competition among service providers will produce lower prices as well. TRW’s proposed clarifications will also maximize the funds that the Commission can raise through its auction of the 700 MHz sub-bands by maximizing the number of interested participants in the Commission’s spectrum auctions and thereby producing higher bids. The resulting increase in the flow of funds to the U.S. Treasury will also clearly serve the public interest.

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To: The Commission

PETITION FOR RECONSIDERATION OR CLARIFICATION

TRW Inc. ("TRW"),¹ by its attorneys and pursuant to Section 1.429 of the Commission's Rules, 47 C.F.R. § 1.429, hereby seeks reconsideration or clarification, as necessary and appropriate, of certain aspects of the Commission's First Report and Order² in the above-captioned proceeding and of certain changes to the Commission's rules adopted in that decision.

The portions of the First R&O and associated rule changes addressed herein directly affect TRW's interests in the market for 700 MHz wireless local loop services, and were not discussed publicly by the Commission in this proceeding prior to the release of the First R&O. TRW is submitting the instant Petition well in advance of the deadline for such filings in order to provide the

¹ TRW has obtained experimental authority to construct and operate a Time Domain Duplex ("TDD") wireless local loop system at 5.8 GHz using direct-sequence spread spectrum signals (Call Sign WB2XFS (FCC File No. 0279-EX-PL-1999) (effective December 10, 1999)). The experimental program, known as "Spitfire," is intended to yield low-cost broadband access to residential and business customers as an alternative to wire or cable modems. The bands in which TRW will conduct its experiment fall within spectrum allocated to unlicensed National Information Infrastructure ("U-NII") devices, but TRW's system can also operate effectively in the 700 MHz bands.

² Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, WT Docket No. 99-168 (FCC 00-5) (released January 7, 2000) ("First R&O").

Commission with as much time as possible for any necessary technical analysis of the matters at issue.

I. Introduction

In the First R&O, the Commission emphasized that its primary objective in adopting service rules for the 746-764 and 776-794 MHz bands was to make those bands available for a variety of wireless services, and to allow wireless licensees to determine for themselves the technologies that they will use in order to provide those services.³ The Commission also stated its intention to set the scope of its service rules "to enable the most efficient and intensive use of this spectrum"⁴ As adopted, however, the Commission's First R&O and related rule changes contain a number of ambiguities and internal contradictions that unfairly jeopardize the ability of fixed wireless service providers -- particularly those using TDD systems -- to make use of the 746-764 and 776-794 MHz bands. Because it readily supports asymmetric data rates with user equipment that is not required simultaneously to transmit and receive, TDD is especially well-suited to low-cost consumer devices -- both stand-alone devices and those embedded in networked appliances.

Of primary concern to TRW is the Commission's unexplained decision to impose a single power limit on most wireless operations in each of the two 700 MHz sub-bands based solely on the particular sub-band that a given operator is using, rather than to apply power limits based on the potential for interference to other services from the type of operation being employed in that

³ See id. at 8 (¶ 15).

⁴ Id. at 4 (¶ 4).

sub-band.⁵ The power threshold established for the 776-794 MHz band, in particular, would effectively prohibit operation of any base station providing broadband Internet services in that band -- in spite of the fact that medium-power fixed wireless operations present less danger of harmful RF radiation or of harmful interference to adjacent public safety operations than the imbalanced high-low power limits set forth by the Commission. Such a result simply cannot be squared with the Commission's stated goal of opening the two 700 MHz sub-bands "to as wide a range of applicants as possible . . . ,"⁶ or with its expectation that its service rules would enable wireless service providers "to deploy new methods of providing high speed Internet access in competition with digital subscriber loop (DSL) and cable modem operators."⁷ Indeed, it seems possible that the effect on fixed services of the power limit that the Commission established for the 776-794 MHz band was unintentional, as the Commission offered no clear rationale in the First R&O for the threshold's applicability to those services.

To address this significant problem, TRW urges the Commission to affirm its original objectives by permitting base, mobile or fixed operations in both the upper and lower 700 MHz sub-bands up to appropriate power limits for each type of operation, instead of designating each band for particular types of wireless operations. In addition, or, if necessary, in the alternative, the Commission should modify its power thresholds to specify as permissible an averaging of the

⁵ As discussed further below, the Commission applied power limits using this latter, more logical approach in its rules for Broadband PCS. See Amendment of the Commission's Rules to Establish New Personal Communications Services, 8 FCC Rcd 7700, 7763 (¶¶ 153-156) (1993) (Second Report and Order); 9 FCC Rcd 4957, 5022 (¶¶ 166-174) (Memorandum Opinion and Order).

⁶ First R&O, FCC 00-5, slip op. at 22 (¶ 49).

⁷ Id. at 4 (¶ 4).

power limits in the two 700 MHz wireless sub-bands such that 500 watts (W) effective radiated power (ERP) would be allowed for all wireless base station operations in both the 746-764 and 776-794 MHz bands. On a related matter, the Commission should also clarify that, for purposes of the power limits and out-of-band ("OOB") emission limits established for the 746-764 and 776-794 MHz bands, the definition of "maximum composite transmit power" shall be construed as being measured over a reasonable period of time -- 3 microseconds.

II. The Commission Should Uphold its Stated Objectives by Basing Power Limits in the 746-764 and 776-794 MHz Bands on the Type of Wireless Operations Conducted In Those Bands, and/or Allow Power Averaging in the Same Bands.

A. The Commission's Power Limits for the 746-764 and 776-794 MHz Bands Unjustifiably Burden Fixed Service Operations.

As amended by the First R&O, the Commission's rules provide that all wireless operations in the 746-764 MHz band will be subject to a power limit of 1000 W ERP, and that all wireless operations in the 776-794 MHz band will be subject to a power limit of 30 W ERP. The Commission states that its power limit for the 746-764 MHz band is designed to provide for base-to-mobile and fixed-to-fixed communication in the lower 700 MHz sub-band, and for mobile-to-base and fixed-to-fixed communication in the upper 700 MHz sub-band.⁸ While the Commission's power threshold for the 776-794 MHz band may or may not be appropriate for mobile-to-base transmissions, however, it should not be applied to fixed operations in the 700 MHz bands. Indeed, a 30 W ERP power limit would render uneconomical TRW's fixed wireless operations in that band, as well as the operations of any base station providing broadband Internet services.

The Commission's decision to adopt power limits for wireless operations in the 746-764

⁸ See id. at 46-47 (¶ 111).

and 776-794 MHz bands was not explained in the First R&O. As the Commission itself noted, it did not propose power limits for wireless operations in the 700 MHz sub-bands in its Notice of Proposed Rule Making in this proceeding.⁹ Rather, the Commission only proposed in the NPRM to establish power thresholds beyond which routine environmental evaluations for RF radiation exposure would be required.¹⁰ Noting that it had adopted 1000 W ERP as the threshold for licensees in the 2.3 GHz bands, and that it had determined that "this power limit was appropriate to ensure compliance with the Commission's RF exposure standards for most situations," the Commission proposed to adopt the same 1000 W ERP threshold for environmental evaluations in both the 746-764 MHz and 776-794 MHz bands.¹¹ The Commission offered no explanation in the First R&O as to why its thresholds for routine environmental evaluations for base and fixed stations in the 2.3 GHz band would not be entirely sufficient for fixed operations in the 776-794 MHz band, or why absolute power limits were required at all in addition to environmental evaluation thresholds.

Furthermore, the Commission did not explain in the First R&O why it chose to apply different power limits to fixed wireless operations in the 746-764 MHz and the 776-794 MHz bands. The Commission did state generally that its power limit of 1000 W ERP for the 746-764 MHz band would reflect the lower sub-band's "primary use for higher-power base station

⁹ See id. at 46 (¶ 108); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, 14 FCC Rcd 11006, 11039-40 (1999) ("NPRM"). As a result, the instant Petition is TRW's first opportunity to comment on the power levels established by the Commission for wireless operations in the 700 MHz bands.

¹⁰ See NPRM, 14 FCC Rcd at 11039-40.

¹¹ Id. at 11040 (¶ 72).

transmissions received by control, mobile and portable stations."¹² The Commission added that "[t]he 1000 w ERP power limit for base and fixed station operations in the 746-764 MHz band should enable satisfactory coverage for commercial systems operating in this band."¹³ As to its 30 W ERP power limit for the 776-794 MHz band, however, the Commission merely stated:

... we have set power limits for the higher frequency band segment at levels that optimize its efficient use for the lower-power transmissions from control, mobile and portable stations that will be received by base stations. This approach enables more efficient spectrum use, by minimizing the 'near-far' interference problem that arises in more extreme form by the juxtaposition of television transmission with land mobile services.¹⁴

This statement does not even mention fixed services, and certainly does not justify the imposition of differing power limits in the two 700 MHz sub-bands on fixed service operations that will be essentially the same in both sub-bands.

The Commission offered at least a partial explanation for its power limit for the upper 700 MHz sub-band in stating that "[t]he 30 w ERP power limit for *mobile, fixed and control* stations in the 777-792 MHz band is the power limit adopted for *mobile and control* station operation in the 700 MHz public safety band."¹⁵ This statement, however, also demonstrates that the Commission has imposed on fixed services in the upper 700 MHz sub-band a power limit that was designed only for mobile and control stations in the 700 MHz public safety band. In establishing such an inappropriate limit, the Commission has – hopefully unintentionally – erected a bar to TDD fixed service operations in the 776-794 MHz band that undermines its claim that "[o]ur Part

¹² First R&O, FCC 00-5, slip op. at 18 (¶ 40).

¹³ Id. at 47 (¶ 111).

¹⁴ Id. at 18 (¶ 40).

¹⁵ Id. at 47 (¶ 111) (emphasis added).

27 rules enable fixed services on either [upper or lower] segment" of the 700 MHz bands.¹⁶

If technical differences between base and mobile stations are the basis for the differing power limits that the Commission has applied to the two 700 MHz sub-bands, TRW submits that the record of this proceeding does not support such a decision. The power limits chosen by the Commission discriminate unfairly against fixed service TDD systems such as TRW's Spitfire system, which is designed to provide service in the 746-764 and 776-794 MHz bands by means of base and mobile stations that may operate in either band, and arbitrarily favor Frequency Division Duplex ("FDD") systems that will segregate base and mobile operations in separate bands. Because the inherent asymmetry of Internet data makes TDD systems better suited to the provision of broadband Internet services than are FDD systems, the Commission's power limits effectively discriminate against broadband Internet service in favor of more symmetrical traffic such as voice service. As noted above, the Commission's own statements in the First R&O suggest that it intended to encourage, rather than prevent, the provision of broadband Internet service by means of technologies of applicants' choosing in the 700 MHz bands.

B. The Commission Should Clarify its Intentions with Respect to Fixed Services by Applying Power Limits to Wireless Operations at 700 MHz Based on the Nature of the Operations, Not the Band in Which they are Conducted.

In the absence of an explanation in the First R&O, TRW assumes that the Commission's primary concern in establishing power thresholds for the 746-764 and 776-794 MHz bands was to limit the potential for interference by the total power of operations in those bands into the center

¹⁶ Id. at 18 (¶ 40). In light of this fact, the Commission is incorrect in suggesting that its plan to pair spectrum in the 746-764 MHz band with spectrum in the 776-794 MHz band will allow for post-auction unpairing of those bands. Id. at 19 (¶ 42). The defined power constraints established in the First R&O would severely restrict the viability of this unpairing.

and adjacent bands. There is no need, however, to place more stringent power limits on fixed wireless operations in the 776-794 MHz band than in the 746-764 MHz band in order to protect other services operating in the center and adjacent bands, as the propagation characteristics of fixed wireless transmissions in the two 700 MHz sub-bands will be virtually identical. The Commission can achieve the same level of protection for other services and also enable fixed services to make full use of the 776-794 MHz band by applying power limits that permit base, mobile or fixed operations in either the upper or lower 700 MHz sub-band -- up to appropriate thresholds for each type of operation -- instead of designating each band for particular types of wireless operations.¹⁷

In fact, the Commission adopted the same approach that TRW advocates herein in its rules for Broadband PCS. Those rules permit either base or mobile/portable operations in any of the frequencies available for Broadband PCS provided that base stations are limited to the equivalent of 1000 W ERP (with an antenna height up to 300 meters HAAT) and that mobile/portable stations are limited to 2 W equivalent isotropic radiated power (EIRP) peak power and employ equipment to limit the power to the minimum necessary for successful communications.¹⁸ As this approach appears to have been effective for Broadband PCS, TRW urges the Commission to clarify its intention with respect to fixed operations in the 700 MHz band through a similar approach that incorporates a power limit for the 776-794 MHz band

¹⁷ The application of differing power limits based on the type of wireless operation in question would also give licensees greater flexibility in designing their systems to avoid interference with the operations of incumbent broadcast licensees during the period in which the incumbents will continue to operate in the 700 MHz bands. See id. at 58-59 (¶ 142-145).

¹⁸ See 47 C.F.R. §§ 24.229, 24.232(a), (b).

permitting fixed operations.¹⁹

In addition -- or, if the Commission for any reason chooses not to implement for wireless services in the 700 MHz bands the approach that it employed for Broadband PCS -- TRW urges the Commission to ensure that fixed wireless system operators have the maximum possible flexibility to provide service by permitting them to distribute, if they choose, the transmit power of their authorized systems evenly between the 746-764 MHz and 776-794 MHz bands. More specifically, the Commission should permit power averaging for both the 746-764 MHz and the 776-794 MHz bands such that fixed wireless systems would be able to operate at 500 W ERP in both bands. Such an approach to power limits would permit the use of increased power levels in the 776-794 MHz bands without causing any increase in overall out-of-band interference to parties operating in the nearby public safety bands. Power averaging in the 700 MHz sub-bands will therefore make those bands available for all wireless operations in accordance with the Commission's stated objectives, and without jeopardizing public safety operations.

III. Power Levels for Wireless Operations and OOB Emission Limits in the 746-764 and 776-794 MHz Bands Should be Measured Over a Time Period of 3 Microseconds.

With further regard to the power limits for wireless operations and OOB emission limits in the 700 MHz bands, TRW urges the Commission to clarify that power levels will be measured over a reasonable period of time. The Commission's rules now indicate that, for purposes of determining compliance with those power limits,

¹⁹ TRW notes that the Commission provided in the First R&O that portable stations operating in the 777-792 MHz band would be subject to a power limit of 3 W ERP. See First R&O, FCC 00-5, slip op. at 46-47 (¶ 111). Thus, the Commission is plainly willing to differentiate among different types of wireless operations in assigning power limits within a single 700 MHz sub-band.

Maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel.²⁰

Neither this provision nor the Commission's statements in the First R&O explain, however, how the Commission's definition of "maximum composite transmit power" is to be applied to the waveform of a system such as Spitfire, or the waveforms of systems that may be similarly situated.

In fact, depending on how the phrase "shall be measured over any interval of continuous transmission . . ." in Section 27.50(a)(4) is interpreted, the effective constraint on the peak power of wireless transmissions may make such transmissions impracticable in the 776-794 MHz band.

TRW believes that the Commission can resolve this ambiguity in its rules by selecting an appropriate time period over which to measure the average power of a wireless system's transmissions. TRW notes that many wireless systems designed for effective use of the limited available 700 MHz spectrum will employ designs that involve a significant difference between

²⁰ 47 C.F.R. § 27.50(a)(4). With further regard to the precedential value of the Commission's rules for Broadband PCS power limits in this proceeding, TRW notes that the means of measuring peak transmit power specified in the rules for Broadband PCS are similar in many respects to those established by the Commission for the 700 MHz bands in the First R&O. Section 24.232 of the rules (regarding power and antenna heights for Broadband PCS) provides:

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, *etc.*, so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

47 C.F.R. § 24.232(c).

peak instantaneous power and power averaged over a given time period. TRW's Spitfire system design, for example, involves an approximate 10 dB difference between peak and average power. Given that the typical maximum data rates and channel bandwidths for operations in the public safety bands are well below 200 KHz, employing a degree of power averaging for purposes of measuring wireless transmissions will have no impact on public safety operations.

In order to determine a reasonable averaging period, the Commission should consider that the typical 200 KHz maximum bandwidth and data rate for public safety operations equates to a symbol time of approximately 5 microseconds. The Commission can therefore prevent deleterious interference to public safety operations by selecting an averaging time that is less than the symbol time.

The Commission may also wish to look for guidance in establishing an appropriate averaging period to its rules regarding the regulation of U-NII devices in the 5.15-5.35 GHz and 5.725-5.825 GHz bands. For purposes of such regulation, transmit power is defined in the rules as "[t]he total energy transmitted over a time interval of at most $30/B$ (where B is the 26 dB emission bandwidth of the signal in hertz) or the duration of the transmission pulse, whichever is less, divided by the interval duration."²¹ Application of this definition to the 746-764 and 776-794 MHz bands would permit averaging in the 10 MHz in which a system such as Spitfire would operate over a period of approximately 3 microseconds (or 6 microseconds, in a bandwidth of 5 MHz).

TRW believes that the smaller of the time periods suggested by the two foregoing approaches best balances the interests of public safety operations with those of wireless service

²¹ 47 C.F.R. § 15.403(h).

operations, and therefore urges the Commission to clarify that power levels and OOB emissions limits in the 700 MHz sub-bands are to be measured over a period of 3 microseconds.²²

IV. The Proposed Clarifications of the Commission's Power Limits for the 746-764 and 776-794 MHz Bands Would Serve the Public Interest.

The clarifications proposed herein with regard to the Commission's power limits for wireless operations in the 746-764 and 776-794 MHz bands will serve the public interest, convenience and necessity by affording the public a greater variety of wireless services at lower prices than would otherwise be possible. By adhering to its original plan to enable applicants to select the technologies that best suit their needs and goals for operations in both 700 MHz sub-bands, the Commission will permit the public to receive important services -- among them, highly efficient broadband Internet access -- that would otherwise not be available. Moreover, the increase in competition that will result from the availability of more wireless services will lower prices for those services and thereby further benefit consumers.

TRW urges the Commission to keep in mind that, in establishing rules for wireless service operations in the 700 MHz bands, it has a rare opportunity to position wireless services as a viable, competitive service technology for residential broadband access. It is essential that the Commission seize that opportunity by clarifying its rules so as to ensure that wireless broadband

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If the Commission clarifies its rules to permit average power measurements as requested above, TRW recognizes that it may find the need to restrict allowable peak-to-average ratios to ensure that peak instantaneous transmit powers are reasonably constrained. The Commission previously addressed this same issue in its Report and Order regarding U-NII devices, in which it established a maximum 13 dB peak-to-average ratio. See Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, 13 FCC Rcd 14355, 14373-14379 (¶¶ 44-52) (1998). TRW believes that the same constraint would be reasonable for purposes of wireless operations in the 700 MHz bands.

Internet access is viable in the 700 MHz bands.²³

TRW's proposed clarifications will also maximize the funds that the Commission can raise through its auction of the 746-764 and 776-794 MHz bands by providing for more widespread use of the available spectrum. As the Commission noted in the First R&O, Congress has provided that the Commission must submit revenues for its auctions of the 746-764 and 776-794 MHz bands to the U.S. Treasury by September 30, 2000.²⁴ Logic suggests that an increase in the number of participants in the Commission's auctions of the 700 MHz frequencies is likely to produce higher bids and, ultimately, greater revenues for the U.S. Treasury. Unless the Commission's service rules for the 746-764 and 776-794 MHz bands are properly clarified, however, the Commission will effectively remove fixed wireless operators from the auction process. The Commission should avoid this problem, and maximize auction revenues for the benefit of U.S. citizens, by clarifying its rules so as to permit fixed wireless operations in both the 746-764 MHz and the 776-794 MHz bands.

²³ As the Commission has acknowledged, it has been directed by Congress to ensure that broadband capability is deployed on a reasonable and timely basis to all Americans. See Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, 14 FCC Rcd 2398, 2401 (¶ 4) (1999).


²⁴ See First R&O, FCC 00-5, slip op. at 2 (¶ 1).

V. **Conclusion**

For the foregoing reasons, the Commission should reconsider or clarify, as necessary and appropriate, its decision and rule modifications in the First R&O as requested herein.

Respectfully submitted,

TRW INC.

By: 
Norman P. Leventhal
Walter P. Jacob

Leventhal, Senter & Lerman P.L.L.C.
2000 K Street, N.W.
Suite 600
Washington, DC 20006-1809
(202) 429-8970

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Its Attorneys